FOR CONTRACT NO.: **11-068004**

INFORMATION HANDOUT

MATERIALS INFORMATION

FOUNDATION RECOMMENDATION

FOUNDATION REVIEW

IMPERIAL IRRIGATION DISTRICT – MEMO: AVAILABILITY OF WATER

MATERIALS INFORMATION BROCHURE

ROUTE: 11-Imp-7,8,98-Var

Edit listed contents to suit job. Eliminate note for extra copies for jobs with no piling.

Include this cover sheet with submittal to District at PS&E, and also include the submittal to HQOE at Expedite. Update as necessary.

INFORMATION HANDOUT

TABLE OF CONTENTS

PROJECT:
CONTRACT NO.: 11-068001

SUBMITTAL TYPE:	PS&E (to District)	EXPEDITE (to HQOE with copy to District)	POST EXPEDITE (to HQOE with copy to District)
SUBMITTAL DATE:			

STRUCTURES SPEC ENGINEER: Denise Blakesley
PHONE: CALNET 498-8577 or (916) 227-8577

Contents	Bridge Number(s)
Foundation Recommendations	59-26TW, 59-0218, 58-0333L/R, 58-03
Foundation Reviews	" " " "
~~Materials Reports~~	
~~Pile Indicator Test Reports~~	
~~Driveability Analysis~~	
~~As Built Log of Test Borings (not in the contract plans)~~	
~~As Built Pile Driving Records~~	

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

To: **Structure Design**

1. Design
2. R.E. Pending File
3. Specifications & Estimates
4. File

Geotechnical Services

1. GD - North ; South ; West
2. GS File Room

Date: 11/7/02

Orchard Rd Sep

Structure Name

11 – Imp – 007 –

District County Route km Post

District Project Development

District Project Engineer

11-0

E.A. Number Structure Number

Foundation Report By:

Dated:

Reviewed By: (SD) (GS)

General Plan Dated:

Foundation Plan Dated:

☑ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

___ Pile Types and Design Loads	___ Footing Elevations, Design Loads, and Locations	___ Effect of Fills on Abutments and Bents
___ Pile Lengths	___ Seismic Data	___ Fill Surcharge
___ Predrilling	___ Location of Adjacent Structures and Utilities	___ Approach Paving Slabs
___ Pile Load Test	___ Stability of Cuts or Fills	___ Scour
___ Substitution of H Piles For Concrete Piles ☐ Yes ☑ No	___ Fill Time Delay	___ Ground Water
		___ Tremie Seals/Type D Excavation

Structure Design Bridge Design Branch No.

Geotechnical Services

Rev. 06/02

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

To: Structure Design

1. Design
2. R.E. Pending File
3. Specifications & Estimates
4. File

Date: 11/7/02

South Alamo Canal Br.
Structure Name

11 - Imp - 037 - 6.27
District / County / Route / km Post

Geotechnical Services

1. GD - North ; South ; West
2. GS File Room

District Project Development
District Project Engineer

11 - 08920 / 58 - 03[illegible]
E.A. Number / Structure Number

Foundation Report By: [illegible] Dated: 11/26/01

Reviewed By: T Skylar [illegible] (SD) [illegible] (GS)

General Plan Dated: [illegible] Foundation Plan Dated: [illegible]

☒ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

Pile Types and Design Loads	Footing Elevations, Design Loads, and Locations	Effect of Fills on Abutments and Bents
Pile Lengths	Seismic Data	Fill Surcharge
Predrilling	Location of Adjacent Structures and Utilities	Approach Paving Slabs
Pile Load Test	Stability of Cuts or Fills	Scour
Substitution of H Piles For Concrete Piles ☐ Yes ☒ No	Fill Time Delay	Ground Water
		Tremie Seals/Type D Excavation

Tom Skylar [illegible] 14 [illegible]

Structure Design / Bridge Design Branch No. / Geotechnical Services

Rev. 96/02

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

To: **Structure Design**

1. Design
2. R.E. Pending File
3. Specifications & Estimates
4. File

Date: 11/7/02

[illegible]
Structure Name

[illegible]
District — County — Route — km Post

Geotechnical Services

1. GD - North ; South ; West
2. GS File Room

District Project Development
District Project Engineer

[illegible] — [illegible]
E.A. Number — Structure Number

Foundation Report By: [illegible] Dated: 11/26/?? ; 10/23/02

Reviewed By: [illegible] (SD) [illegible] (GS)

General Plan Dated: [illegible] Foundation Plan Dated: [illegible]

☒ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

___ Pile Types and Design Loads	___ Footing Elevations, Design Loads, and Locations	___ Effect of Fills on Abutments and Bents
___ Pile Lengths	___ Seismic Data	___ Fill Surcharge
___ Predrilling	___ Location of Adjacent Structures and Utilities	___ Approach Paving Slabs
___ Pile Load Test	___ Stability of Cuts or Fills	___ Scour
___ Substitution of H Piles For Concrete Piles ☐ Yes ☒ No	___ Fill Time Delay	___ Ground Water
		___ Tremie Seals/Type D Excavation

[illegible] — 2
Structure Design — Bridge Design Branch No.

[illegible]
Geotechnical Services

Rev. 06/02

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Date: 11/7/02

To: Structure Design

1. Design
2. R.E. Pending File
3. Specifications & Estimates
4. File

Orchard Road [illegible]
Structure Name

Geotechnical Services

1. GD - North ; South ; West
2. GS File Room

11 - Imp - [illegible] - 11.2
District | County | Route | km Post

District Project Development
District Project Engineer

11 - [illegible] | 57 - [illegible]
E.A. Number | Structure Number

Foundation Report By: [illegible] | Dated: [illegible]

Reviewed By: [illegible] (SD) | R [illegible] (GS)

General Plan Dated: 10/23/02 | Foundation Plan Dated: [illegible]

☑ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

- Pile Types and Design Loads
- Pile Lengths
- Predrilling
- Pile Load Test
- Substitution of H Piles For Concrete Piles ☐ Yes ☐ No
- Footing Elevations, Design Loads, and Locations
- Seismic Data
- Location of Adjacent Structures and Utilities
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- Fill Surcharge
- Approach Paving Slabs
- Scour
- Ground Water
- Tremie Seals/Type D Excavation

[illegible] [illegible]
Structure Design | Bridge Design Branch No.

[illegible]
Geotechnical Services

Rev. 06/02

Memorandum

Flex your power!
Be energy efficient!

To: MR. MAJID MADANI
DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN - MS 9
OFFICE OF BRIDGE DESIGN - SOUTH
BRIDGE DESIGN BRANCH 14

Attention: Mr. Tony Skreslet

Date: December 18, 2002

File: 11-IMP-7-KP 1.9/11.0
11-068001
Orchard Road Sep
(Rte 7/8) Widening
Br. # 58-0218

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES - MS 5
GEOTECHNICAL DESIGN – SOUTH 2, BRANCH B

Subject: Supplemental Foundation Recommendations

A request for foundation recommendations was received from Structure Design (SD), Office of Bridge Design - South, for the proposed widening of Orchard Road Separation, Bridge Number 58-0218. The original Foundation Report, dated June 13, 2002, did not contain settlement data for the abutment support locations. The laboratory soil analysis for the settlement data was not available at that time. This report includes the settlement data and construction recommendations.

Foundation Recommendations

The following supplemental foundation recommendations are for the proposed embankment widening, Orchard Road Separation located on Route 7, Bridge Number 58-0218, as shown on the General Plan dated October 31, 2001. The proposed structure abutment supports will be placed in new fill embankment widened approximately 9.1 m (30 ft) out from the existing embankment and approximately 7.0 m (23 ft) high. The soils at this site consist of alternating soft to very stiff lean clays with silt, with interbeds and lenses of silty fine sand. Due to the nature of the soils located under these proposed embankment widenings, the embankments are expected to settle approximately 254 mm (10 in) under the applied load of the new embankments. This consolidation should take place over approximately three months.

Construction Considerations

1. The fill embankment shall be placed and compacted in accordance with Standard Specifications, Section 19-6 "Embankment Construction".

2. Newly placed embankment fill will require a settlement period of 90 days prior to beginning construction of the abutment foundations in the embankment. This waiting period shall start after the final grade is in place.

3. Settlement shall be monitored. Monitoring devices shall consist of settlement platforms placed at the bottom of the new fill, on existing ground prior to any fill placement. With the Engineer's approval, the waiting period may be reduced if the contractor provides evidence that the settlement has ceased.

4. Construction of the abutment foundations is not to begin until 100% primary consolidation of the underlying clay soils has been completed.

The recommendations contained in this report are based on specific project information regarding design loads and structure support locations that have been provided to Office of Geotechnical Design – South 2, Branch B. If any conceptual changes are made during final project design, Office of Geotechnical Design – South 2, Branch B, should review those changes to determine if the foundation recommendations contained in this report are still applicable.

Any questions regarding the above recommendations should be directed to Gina Pursell, (916) 227-4539 (CALNET 498-4539), Office of Geotechnical Design – South 2, Branch B.

Report by: Date

12/18/02

GINA W. PURSELL, R.C.E. # 54512
Associate Materials & Research Engineer
Office of Geotechnical Design – South 2
Branch B

REGISTERED PROFESSIONAL ENGINEER
GINA W. PURSELL
No. 54512
Exp. 12-31-03
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File
Abbas Abghari – OGDS 2
John Stayton - Specs & Estimates
Mark DeSalvatore – OGDS 2
Tom Ruckman - Specs & Estimates
Project Files – North
Rruelas – Project Management (D11)
Project Files – South
Victor Diaz– Proj Engr (D11)
Lan Hunyh - PCE
Mark Phelan - Proj Mgr (D11)

Memorandum

Flex your power!
Be energy efficient!

To: MR. RON BROMENSCHENKEL, Chief
Structure Design
Office of Bridge Design - South
Bridge Design Branch 14

Date: June 13, 2002

File: 11-IMP-7-KP 1.9/11.0
EA 11-068001
Orchard Road Sep.
Bent 2 Retrofit
Bridge No. 58-0218

Attention: Tony Skreslet

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design - South MS #5

Subject: Foundation Recommendations

Introduction

This report presents foundation recommendations for the proposed Bent 2 Retrofit of the Orchard Road Separation (Br. #58-0218). During the completion of the Foundation Recommendation Report for the bridge, the Office of Geotechnical Design-South, Structure Foundations-Branch F received an additional request for the retrofit of Bent 2 at the Orchard Road Separation from the Structure Design (dated November 29, 2001). The recommendations provided below are based on a review of the available records, laboratory data and the recent field investigation completed in October 2001 by the Office of Geotechnical Design-South, Structure Foundations-Branch F for the proposed Bent 2 retrofit of the Orchard Road Separation. The available records reviewed consisted of the "As-Built" contract plans, the General Plan (dated December 1, 2001), the Foundation Plan (dated November 27, 2001), Bent Details No. 2 Sheet (dated December 7, 2001) and the soil data obtained during the 2001 field investigation. The 2001 field investigation consisted of three exploratory mud rotary sample borings located near the existing support locations that were advanced using a self-casing wireline drilling method. The elevations shown on the As-Built Log of Test Borings (LOTB) are based on the NGVD 1929+500 ft. The elevations shown on the 2001 Log of Test Borings are based on the NAVD 1988 +100 m. All elevations referred to in this report are based upon the NAVD 1988+100 m. For subsurface data and boring locations, please refer to the LOTB sheets that will be forwarded once completed.

Project/Site Description

Currently at the site is an existing bridge that spans over Route 8 and is located at Kilometer Post 11.0 (Post Mile 6.8) on Route 7 in Imperial County, south of the city of Holtville. The existing Orchard Road Separation, built in 1971 by the Division of Highways, consists of a two lane county road that is a segment of the new Route 7 alignment. The existing structure spans over Route 8 with west and east bound on and off ramps to and from Route 8. The existing Orchard

Road Separation consists of a two span continuous reinforced concrete box girder (4 cell) structure on reinforced concrete open end diaphragm abutments and a single column bent, all supported on driven concrete Raymond Step-Tapered Piles.

The Orchard Road Separation is a segment of the new Route 7 alignment project that consists of converting an existing two lane county road into a divided four lane highway. The existing structure will be widened (refer to Foundation Recommendations Memorandum previously sent dated November 26, 2001) and Bent 2 will be retrofitted. The retrofit will include the addition of CIDH piles to the existing Bent 2 support.

Geology

The project site lies in the Imperial Valley as part of the Salton Trough geomorphic province. The foundation materials at the proposed bridge site consisted of fill material underlain by native material interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The fill material consisted of silty sand with gravel. The native underlying material consisted of lean and fat clay interbedded with silt and sitly sand lenses. Horizontal bedding and laminations were evident within the silt and clay layers. The materials encountered at the site during the recent field investigation can generally be divided into two units.

The soils in the upper most units were interpreted as fill material placed during the construction of the Orchard Separation in 1971. The fill material was approximately 8.4 m (27.6 ft) thick and extended to an approximate elevation of 103.8 m (340.5 ft). The fill material consisted of approximately 6.6 m (21.5 ft) of medium dense and dense silty sand with gravel overlying approximately 1.8 m (5.9 ft) of medium dense silty sand with lean clay.

Underlying the fill material located at each abutment location was the lower most unit that was interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The general soil profile from the ground surface to the maximum depth explored consisted of:

1. Approximately 15.7 m (51.5 ft), extending down to an approximate elevation of 89.8 m (294.6 ft) of soft and firm to stiff lean clay with silt with interbeds and lenses of silt and silty fine sand.

2. Approximately 4.6 m (15.1 ft), extending down to an approximate elevation of 85.2 m (279.5 ft) of loose to medium dense silty fine sand.

3. Approximately 10.6 m (34.8 ft), extending down to an approximate elevation of 74.6 m (244.8 ft) of stiff to very stiff lean and fat clay with silt with interbeds and lenses of silt and silty fine sand.

Refer to the LOTB sheets for more site specific data pertaining to the foundation investigations.

Groundwater

Groundwater was encountered during the field investigation on October 18, 2001 as shown on the LOTB sheet at an approximate elevation of 103.2 m (338.6 ft). The As-Built LOTB sheet shows the groundwater at an approximate elevation of 102.9 m (337.6 ft). Due to the existing land in the area being primarily farmland that is irrigated and drained by a network of canals and drains, it should be anticipated that groundwater levels will fluctuate. Groundwater elevations/levels will also vary due to seasonal precipitation.

Corrosion Test Results

Soil samples collected near Abutment 1 location (B-01-1) and Abutment 3 location (B-01-3) were combined to make composite samples during the foundation investigation. The Office of Testing and Technology Services, Corrosive Technology Branch tested the composite samples for corrosive potential. The results of the laboratory tests determined that the composite samples were considered to be corrosive. Refer to Table 1 below for specific test results.

Table 1: Corrosion Test Summary-Composite Samples For Orchard Road Separation (Br. No. 58-0218)

Support Location/ Corrosion Number	Sample Depth (m)	pH	Minimum Resistivity (Ohm-Cm)	Sulfate Content (PPM)*	Chloride Content (PPM)*
B-01-1 Abutment 1 #01-0968	0-9.1	7.9	465	1409	167
B-01-1 Abutment 1 #01-0969	9.1-21.3	7.8	220	969	1800
B-01-3 Abutment 3 #01-0970	0-8.4	8.0	655	1073	86
B-01-3 Abutment 3 #01-0971	8.4-20.3	8.0	570	592	220

*The Corrosion Technology Branch defines a site to be corrosive if the soil and/or water contains more than 500 ppm of chlorides, or more than 2000 ppm of sulfates, or has a minimum resistivity of less than 1000ohm-cm or has a pH of 5.5 or less.

Please refer to the specific corrosion recommendations completed on December 14, 2001 and submitted to the Office of Bridge Design-South, Bridge Design Branch 14 by the Office of Testing and Technology Services, Corrosion Technology Branch.

Seismic Design Considerations

The Office of Geotechnical Earthquake Engineering (OGEE) provided Final Seismic Design Recommendations for the site in the memorandum dated December 20, 2001. The controlling fault for the site is the Brawley-Imperial/W with a maximum credible earthquake of $M_w = 7.0$ located approximately 4.8 km southwest of the site. The estimated peak horizontal bedrock acceleration, based on Caltrans California Seismic Hazard Map is estimated to be 0.5g. Liquefaction analysis indicates the soil does not have the potential to liquefy though shallow groundwater is present at the site. Refer to the groundwater section of the report for elevations measured during the February 1965 and the recent October 2001 foundation investigations.

Please refer to Jinxing Zha or Angel Perez-Cobo at the Office of Geotechnical Earthquake Engineering if there are any questions with the Final Seismic Design Recommendations.

Foundation Recommendations

The following foundation recommendations are for the proposed retrofit of Bent 2 for the Orchard Road Separation, Br. No. 58-0218. It is recommended that the proposed widening be supported by 600 mm Cast-In-Drilled-Hole (CIDH) Piles at the Bent 2 support location. The Specified Pile Tip Elevations (SPTE) are listed below in Table 2. The ultimate geotechnical capacity will equal or exceed the required nominal resistance in compression and tension shown in Table 2. Refer to the Pile Data Table (Table 2) to determine which nominal resistance controlled the SPTE

Table 2

Pile Data Table (Proposed Bent 2 Retrofit for Orchard Road Separation)

Support Location	Pile Type	Design Load	Nominal Resistance		Design Tip Elevation*	Specified Tip Elevation
			Compression	Tension		
Bent 2	600-mm diameter CIDH Concrete Pile	N/A	1525 kN	550 kN	88.5 m (290.4 ft) (1) 94.9 m (311.4 ft) (2)	88.5 m (290.4 ft)

**Design tip elevations are controlled by the following demand (1) Compression and (2) Tension.*

General Notes

1. If lateral demands exist on the support piles, the structural design engineer shall indicate on the plans, in the pile data table, the design pile tip elevations required to meet the lateral load demands. If the specified tip elevations given in the above pile data tables is not adequate to meet the lateral demands; our office shall be contacted for further recommendations.
2. Support locations are to be plotted on the Log of Test Borings, in plan view, as stated in "Memos to Designers 4-2." The plotting of support locations should be completed prior to the foundation review.

Construction Considerations

1. Difficult foundation construction should be anticipated due to high ground water. Due to the presence of high and fluctuating water levels, simple dewatering of the drilled holes by pumping methods may not be feasible. The contractor should anticipate constructing the CIDH piles using slurry displacement method.

2. Caving conditions may be encountered during CIDH pile construction. The underlying lenses of saturated silty fine sands and sands are susceptible to caving during construction of the CIDH piles. Temporary casing may be necessary to control caving during construction. All temporary casing shall be removed during concrete placement.

3. The designed geotechnical capacity of the CIDH piles is based only on the skin friction developed from 600 mm below the pile cap to 600 mm above the specified pile tip elevation. No end bearing was considered due to anticipated method of construction.

Any questions regarding the above recommendations should be directed to Jacqueline Martin at (916) 227-5392, or Mark DeSalvatore (916) 227-5391, of the Office of Geotechnical Design-South, Structure Foundations-Branch F.

Report by

Supervised by Date: 6/13/02

Jacqueline A. Martin

No. 039499
Exp. 12/31/02
CIVIL
STATE OF CALIFORNIA

Jacqueline A. Martin
Engineering Geologist
Office of Geotechnical Design-South
Structure Foundations-Branch F

Mark DeSalvatore, R.C.E., No.039499
Senior Materials and Research Engineer
Office of Geotechnical Design-South
Structure Foundations-South Branch

cc: R.E. Pending File-Struct. Const.
Tom Ruckman - Specs. & Development
RRuelas - Project Management (D11)
Victor Diaz - District (11) Project Engineer
Geology North
RGES.30
John Stayton - Specs. & Estimates
Lan Hunyh – Project Coordination Engineer
Mark Phelan - District (11) Project Manager
Abbas Abhgari - OGEE
Geology South

State of California | Business, Transportation and Housing Agency

Memorandum

To: MR. RON BROMENSCHENKEL, CHIEF
Structure Design
Office of Bridge Design-South
Bridge Design Branch 14

Attention: Tony Skreslet

Date: November 26, 2001

File: 11-IMP-7-KP 1.9/11.0
EA 11-068001

Caltrans Metric

Orchard Road Sep. (Widen)
Bridge No. 58-0218

From: **DEPARTMENT OF TRANSPORTATION**
ENGINEERING SERVICE CENTER
Geotechnical Services - MS 5
Office of Geotechnical Design –South
Structure Foundations-South Branch

Subject: Final Foundation Recommendations

Introduction

This report presents final foundation recommendations for the proposed right side widening of the Orchard Road Separation (Bridge No. 58-0218). The recommendations provided below are based on a review of the available records, laboratory data and the recent field investigation completed in October 2001 by the Office of Geotechnical Design-South, Structure Foundations-South Branch for the proposed widening of the Orchard Road Separation. The available records reviewed consisted of the "As-Built" contract plans, the General Plan and Foundation Plan dated October 1, 2001 and the soil data obtained during the 2001 field investigation. The 2001 field investigation consisted of three exploratory mud rotary sample borings located near the existing support locations that were advanced using a self-casing wireline drilling method. The elevations shown on the As-Built Log of Test Borings (LOTB) are based on the NGVD 1929+500 ft. The elevations shown on the 2001 Log of Test Borings are based on the NAVD 1988 +100 m. For subsurface data and boring locations, please refer to the LOTB sheets that will be forwarded once completed.

Project/Site Description

The existing structure spans over Route 8 and is located at Kilometer Post 11.0 (Post Mile 6.8) on Route 7 in Imperial County, south of the city of Holtville. Currently at this location, the existing Orchard Road Separation, built in 1971 by the Division of Highways, consists of a two lane county road that is a segment of the new Route 7 alignment. The existing structure spans over Route 8 with west and east bound on and off ramps to and from Route 8. The existing Orchard Road

Separation consists of a two span continuous reinforced concrete box girder (4 cell) on reinforced concrete open end diaphragm abutments and a single column bent, all supported on driven concrete piles.

The construction of the proposed widening is a segment of the new Route 7 alignment project that consists of converting an existing two lane county road into a divided four lane highway. The proposed right side widening of the existing structure is to consist of a two span cast-in-place pre-stressed concrete box girder (3 cell) on reinforced concrete open end diaphragm abutments and a single column bent. The new structure is expected to match the existing structure support locations, as shown on the General and Foundation Plans (October 1, 2001).

Geology

The project site lies in the Imperial Valley as part of the Salton Trough geomorphic province. The foundation materials at the proposed bridge site consisted of fill material underlain by native material interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The fill material consisted of silty sand with gravel. The native underlying material consisted of lean and fat clay interbedded with silt and sitly sand lenses. Horizontal bedding and laminations were evident within the silt and clay layers. The materials encountered at the site during the recent field investigation can generally be divided into two units.

The soils in the upper most units were interpreted as fill material placed during the construction of the Orchard Separation in 1971. The fill material was approximately 8.4 m (27.6 ft) thick and extended to an approximate elevation of 103.8 m (340.5 ft). The fill material consisted of approximately 6.6 m (21.5 ft) of medium dense and dense silty sand with gravel overlying approximately 1.8 m (5.9 ft) of medium dense silty sand with lean clay.

Underlying the fill material was the lower most unit that was interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The general soil profile from the ground surface to the maximum depth explored consisted of:

1. Approximately 15.7 m (51.5 ft), extending down to an approximate elevation of 89.8 m (294.6 ft) of soft and firm to stiff lean clay with silt with interbeds and lenses of silt and silty fine sand.

2. Approximately 4.6 m (15.1 ft), extending down to an approximate elevation of 85.2 m (279.5 ft) of loose to medium dense silty fine sand.

3. Approximately 10.6 m (34.8 ft), extending down to an approximate elevation of 74.6 m (244.8 ft) of stiff to very stiff lean and fat clay with silt with interbeds and lenses of silt and silty fine sand.

Refer to the LOTB sheets for more site specific data pertaining to the foundation investigations.

Groundwater

Groundwater was encountered during the field investigation on October 18, 2001 as shown on the LOTB sheet at an approximate elevation of 103.2 m (338.6 ft). The As-Built LOTB sheet shows the groundwater at an approximate elevation of 102.9 m (337.6 ft). Due to the existing land in the area being primarily farmland that is irrigated and drained by a network of canals and drains, it is anticipated that groundwater levels may fluctuate. Groundwater will also vary due to seasonal precipitation.

Corrosion Test Results

The corrosion test results will be provided when laboratory testing of the samples has been completed. Once the results are received, A request for corrosion recommendations that will include the corrosion test results will be submitted to the Office of Testing and Technology Services, Corrosion Technology Branch. A copy of this memorandum will be sent to the Office of Bridge Design-Central, Bridge Design Branch 14 giving the specific corrosion recommendations.

Seismic Design Considerations

The Office of Geotechnical Earthquake Engineering (OGEE) has provided Preliminary Seismic Design Recommendations based on the As-Built LOTB for the site in the memorandum dated October 18, 2000. The controlling fault for the site is the Brawley-Imperial/W with a maximum credible earthquake of M_w = 7.0 located approximately 4.8 km southwest of the site. The estimated peak horizontal bedrock acceleration, based on Caltrans California Seismic Hazard Map is estimated to be 0.5g. Liquefaction analysis indicates the soil does not have the potential to liquefy though shallow groundwater is present at the site. Refer to the groundwater section of the report for elevations measured during the February 1965 and the recent October 2001 foundation investigations.

On November 14, 2001 a request for Final Seismic Design Recommendations along with copies of the current October 2001 field investigation logs were submitted to the Office of Geotechnical Earthquake Engineering. Additional information and seismic recommendations will be included in a Final Seismic Memorandum prepared by the OGEE.

Settlement

The estimated magnitude of settlement and waiting periods will be provided when laboratory testing of the undisturbed samples has been completed.

Final Foundation Recommendations

The following foundation recommendations are for the proposed right side widening of the Orchard Road Separation (Bridge No. 58-0218) as shown on the General and Foundation Plan, dated October 1, 2001. The proposed widening of the structure may be supported on Class 400C, Alternative "X" piles at Abutment 1 and 3 support locations and Class 625C, Alternative "X" piles at the Bent 2 location. The recommended Specified Pile Tip Elevations (SPTE) are listed below in Table 2 for all support locations. The SPTE will provide support piles with an ultimate geotechnical pile capacity that will equal or exceed the required Nominal Resistances as shown in Table 2 below. Refer to Table 2 below to determine the required Nominal Resistance that controlled the SPTE.

Table 2. Pile Data Table (Proposed Orchard Road Sep. Widening, Br. No. 58-0218)

Support Location	Pile Type	Design Load	Nominal Resistance		Design Tip Elevation*	Specified Pile Tip Elevation
			Compression	Tension		
Abutment 1	Class 400C Alt. "X"	400 kN	800 kN	0 kN	91.2 m (299.2 ft) (1)	91.2 m (299.2 ft)
Bent 2	Class 625C Alt. "X"	575 kN	1150 kN	550 kN	84.8 m (278.2 ft) (1) 91.8 m (301.8 ft) (2)	84.8 m (278.2 ft)
Abutment 3	Class 400C Alt. "X"	400 kN	800 kN	0 kN	91.2 m (299.2 ft) (1)	91.2 m (299.2 ft)

**Design tip elevations are controlled by the following demand (1) Compression and (2) Tension.*

General Notes

Support locations are to be plotted on the Log of Test Borings in the plan view as stated in "Memos to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

Construction Considerations

1. Due to the presence of high groundwater, Type "D" structure excavation shall be shown on the contract plans at Bent 2 location.

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2. The calculated geotechnical capacities of the driven Class 400C Alt. "X" piles at Abutment 1 and 3 locations and the Class 625C Alt."X" piles at Bent 2 location are to be developed predominately by skin friction.

3. Due to the geotechnical capacities being based primarily on skin friction at all supports, no jetting or drilling to assist driving shall be allowed to facilitate driving piles to the specified pile tip elevation.

4. The Class 400C Alt. "X" piles at both the Abutment 1 and 3 locations are to be driven in predrilled holes through the approach embankment fills. The predrilling shall be in accordance with Section 49-1.06 of the Standard Specifications, "Predrilled Holes," and shall extend to elevation 105.5 m (346.1 ft).

5. No abutment piles are to be installed through the approach embankment fills until the settlement period has been completed. The settlement waiting period will be provided when consolidation testing has been completed.

6. Pile bearing for the driven Class 400C, Alt. "X" and the driven Class 625C, Alt. "X" will be accessed by the ENR equation according to Standard Specifications, Section 49-1.08, "Bearing Values and Penetration".

7. At Abutment 1 and 3 locations, any driven Class 400C, Alt. "X" pile that achieves two times the required design loading as shown on the Contract Plans within in 1.5 m (5.0 ft) of the SPTE may be considered satisfactory and cut off with the written approval from the Engineer. Two times the required design loading shall be 800 kN.

8. At Bent 2 location, any driven Class 625C, Alt. "X" pile that achieves two times the required design loading as shown on the Contract Plans within 1.5 m (5.0 ft) of the SPTE may be considered satisfactory and cut off with the written approval from the Engineer. Two times the required design loading shall be 1150 kN.

9. The contractor should anticipate that the driven piles may not achieve bearing at the end of driving at the SPTE due to the nature of underlying cohesive soils. Any driven pile that does not achieve bearing at the end of driving should be restruck after a minimum setup period. A minimum setup period of 12 hours is recommended.

The recommendations contained in this report are based on specific project information regarding structure type, location and design loads that have been provided to the Office of Bridge Design-Central, Bridge Design Branch 14. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South, Structure Foundations-South Branch should be contacted immediately to review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Jacqueline Martin at (916) 227-5282, or Mark DeSalvatore (916) 227-7056.

Report by:

Jacqueline A. Martin

Jacqueline A. Martin
Engineering Geologist
Office of Geotechnical Design-South
Structure Foundations-South Branch

Supervised by:

Date: 11/28/01

Mark DeSalvatore, R.C.E., No.039499
Senior Materials and Research Engineer
Office of Geotechnical Design-South
Structure Foundations-South Branch

REGISTERED PROFESSIONAL ENGINEER
Mark DeSalvatore
39499
EXP. 12/31/05
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File-Struct. Const.
DBarlow - Specs. & Estimates
TRuckman - Specs. & Development
RRuelas - Proj Mgmt (D11)
LHunyh - PCE
MPhelan - District (11) Project Manager
VDiaz - District (8) Project Engineer
JChai - OGES
AAbhgari - GEEB
Geology North
Geology South
RGES.30

Memorandum

To: JACKIE MARTIN - MS#5
Office of Geotechnical Design-South
Geotechnical Services

Date: December 14, 2001

File: 11-Imp-7-KP1.9/11.0
EA: 11-068001
Bridge No. 58-0218
Orchard Road Sep.
(Widen)

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
MATERIALS ENGINEERING AND TESTING SERVICES - MS #5

Subject: Corrosion Review for Orchard Road Sep. Widen

We have completed our corrosion review of Orchard Road Separation Bridge Widen, outlined in a December 6, 2001, memo sent to Doug Parks of the Corrosion Technology Branch. Our review is based on corrosion test results of soil samples, information from the Log of Test Borings and the California Department of Transportation (Department) Bridge Design Specifications, Article 8.22 (July 2000), and Interim Memo to Designers 10-5 (December 2000) and a Preliminary Foundation Recommendation dated November 16, 2000.

Project Description

The existing Orchard Road Separation structure consists of a two-span continuous reinforced concrete box girder (4 cell) on reinforced concrete open-ended diaphragm abutments with a single column bent. All structure supports are supported on driven concrete piles.

The proposed right-side widening of the existing Orchard Road Separation structure shall consist of a two span cast-in-place prestressed concrete box girder (3 cell) on reinforced concrete open-ended diaphragm abutments with a single column bent. Abutments 1 and 3 shall be supported on Class 400C, Alternative "X" piles. The single bent column shall be supported on Class 625C, Alternative "X" piles.

The foundation materials at the proposed right-side widening consist of fill material underlain by native soil interpreted as recent lake bed deposits derived from the historical Lake Coahuilla. This fill material consists of silty sand and gravel. The native soils consist of inter-bedded layers of clay and silt to silty sand material.

Corrosion Review

The Department defines a corrosive area as an area where the soil and/or water contains more than 500 ppm of chlorides, more than 2000 ppm of sulfates, has a minimum resistivity of less than 1000 ohm-cm, or has a pH of 5.5 or less.

Four borehole soil samples were obtained and tested for pH, minimum resistivity, sulfate concentration and chloride concentration in accordance with California Test Method (CTM) 643, 417 and 422. Soil sample test results are as follows:

The pH level of the soil ranged from 7.8 to 8.0. The minimum resistivity of the soil ranged from 220 ohm-cm to 655 ohm-cm. The sulfate concentration of the soil ranged from 592 ppm to 1,409 ppm, and the chloride concentration of the soil ranged from 86 ppm to 1800 ppm. Ground water was encountered at an approximate elevation of 103.2 meters based on an October 18, 2001 field exploration, and is expected to fluctuate with seasonal changes.

Corrosion Recommendations

The soil on-site is considered corrosive based on corrosive soil conditions which include low minimum resistivity levels and high chloride concentration. In order to maintain a 75-year design life for the right-side widening of the existing Orchard Road Separation structure, we recommend the following corrosion mitigation measures:

- Reinforced concrete in contact with corrosive soil should be designed in accordance with BDS Article 8.22 (July 2000). Reference Specification S8-C 04 (90CORR), "Corrosion Control for Portland Cement Concrete", should be used to ensure compliance with the requirements of BDS Article 8.22 (July 2000). Tom Ruckman (916-227-8591) of the Structures Specifications Branch should be contacted for assistance related to Reference Specification S8-C 04 (90CORR). Controlling corrosion parameters for reinforced concrete at this site are a low minimum resistivity level of 220 ohm-cm and a soil chloride concentration of 1800 ppm.

- Revisions concerning corrosion issues outlined in BDS Article 8.22 (July 2000) has not been incorporated into the July 1999 Standard plans therefore; corrosion mitigation measures stated above should be implemented.

If you have any questions regarding our comments, please contact Susan Hall at (916) 227-7009 or Doug Parks at (916) 227-7007.

Susan Hall
SUSAN HALL
Transportation Engineer (Civil)
Corrosion Technology Branch

Reviewed By:

DOUGLAS M. PARKS, Chief
Corrosion Technology Branch

c: Majid Madani, Division of Structure Design-Branch 14
Rob Reis, Corrosion Technology Branch
Mike Piepoli, Corrosion Technology Branch

Memorandum

Flex your power!
Be energy efficient!

To: MR. MAJID MADANI
DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN - MS 9
OFFICE OF BRIDGE DESIGN - SOUTH
BRIDGE DESIGN BRANCH 14

Attention: Mr. Tony Skreslet

Date: December 10, 2002

File: 11-IMP-7-KP 1.9/11.0
11-068001
South Alamo Canal Bridge L/R
Bridge No. 58-0334 3 L/R

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES - MS 5
GEOTECHNICAL DESIGN – SOUTH 2, BRANCH B

Subject: Supplemental Foundation Recommendations

A request for foundation recommendations was received from Structure Design (SD), Office of Bridge Design - South, for the proposed new bridge, South Alamo Canal Bridge, Bridge Number 58-0333L/R. The original Foundation Report, dated November 26, 2001, did not contain settlement data for the abutment support locations. The laboratory soil analysis for the settlement data was not available at that time. This report includes the settlement data and construction recommendations.

Foundation Recommendations

The following supplemental foundation recommendations are for the proposed new bridge, South Alamo Canal Bridge, to be located on Route 7, bridge number 58-0333L/R, as shown on the General Plan dated June 13, 2002. The proposed structure abutment supports will be placed in a fill embankment approximately 3.3 m (11 ft) high and 67.1 m (220 ft) wide at the base. The soils at this site consist of alternating soft to very stiff lean clays with silt, interbedded with lenses of silty fine sand. Due to the nature of the soils located under these proposed embankments, the embankments are expected to settle approximately 279 mm (11 in) under the applied load of the new embankments. This consolidation should take place over approximately three months.

Construction Considerations

1. The fill embankment shall be placed and compacted in accordance with Standard Specifications, Section 19-6 "Embankment Construction".

2. Newly placed embankment fill will require a settlement period of 90 days prior to beginning construction of the abutment foundations in the embankment. The embankment shall be brought up to the planned grading plane before the settlement period begins. The waiting period may be

reduced if the contractor chooses to monitor the settlement and provide evidence that the settlement has ceased. Monitoring devices shall consist of settlement monuments placed at the top of the fill after fill placement is completed to final grade.

3. No foundations are to be installed in the approach embankment fills until 100% primary consolidation of the underlying clay soils has been completed.

The recommendations contained in this report are based on specific project information regarding design loads and structure support locations that have been provided to Office of Geotechnical Design – South 2, Branch B. If any conceptual changes are made during final project design, Office of Geotechnical Design – South 2, Branch B, should review those changes to determine if the foundation recommendations contained in this report are still applicable.

Any questions regarding the above recommendations should be directed to Gina Pursell, (916) 227-4539 (CALNET 498-4539), Office of Geotechnical Design – South 2, Branch B.

Report by: Date

12/10/02

GINA W. PURSELL, R.C.E. # 54512
Associate Materials & Research Engineer
Office of Geotechnical Design – South 2
Branch B

REGISTERED PROFESSIONAL ENGINEER
GINA W. PURSELL
No. 54512
Exp. 12-31-03
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File
Abbas Abghari – OGDS 2
John Stayton - Specs & Estimates
Mark DeSalvatore – OGDS 2
Tom Ruckman - Specs & Estimates
Project Files – North
Rruelas – Project Management (D11)
Project Files – South
Victor Diaz– Proj Engr (D11)
Lan Hunyh - PCE
Mark Phelan - Proj Mgr (D11)

Memorandum

To: MR. RON BROMENSCHENKEL, CHIEF
Structure Design
Office of Bridge Design-South
Bridge Design Branch 14

Attention: Tony Skreslet

Date: November 26, 2001

File: 11-IMP-7-KP 1.9/11.0
EA 11-068001

South Alamo Canal Bridge L/R
Bridge No. 58-0333L/R

From: DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER
Geotechnical Services - MS 5
Office of Geotechnical Design –South
Structure Foundations-South Branch

Subject Final Foundation Recommendations

Introduction

This report presents final foundation recommendations for the proposed new left and right South Alamo Canal Bridges (Bridge No. 58-0333L/R). The recommendations provided below are based on a review of the available records, laboratory data and the recent field investigation completed in October 2001 by the Office of Geotechnical Design-South, Structure Foundations-South Branch for the proposed new left and right South Alamo Canal Bridges. The available records reviewed consisted of the General Plan dated July 2, 2001, the Foundation Plan dated October 1, 2001 and the soil data obtained during the 2001 field investigation. The 2001 field investigation consisted of two exploratory mud rotary sample borings located near the existing support locations that were advanced using a self-casing wireline drilling method. The elevations shown on the 2001 Log of Test Borings are based on the NAVD 1988 +100 m Vertical Datum. For subsurface data and boring locations, please refer to the LOTB sheets that will be forwarded once completed.

Project/Site Description

The new structures will be located on Route 7, approximately 0.4 km south of Route 8 at Kilometer Post 6.27 (Post Mile 3.9) in Imperial County, south of the city of Holtville. Currently at this location, Heber Road consists of a two lane county road that runs east and west and is approximately 0.4 km south of the Orchard Road Separation/Route 8. The existing land in the area is primarily farm land that is irrigated and drained by a network of canals and drains operated by the Imperial Irrigation District.

The construction of the new bridges is a segment of the new Route 7 alignment project that consists of converting an existing two lane county road into a divided four lane highway. The proposed new left structure is to consist of a single span cast-in-place reinforced box girder (8 cell) on seat abutments. The proposed new right structure is to consist of a single span cast-in-place reinforced box girder (12 cell) on seat abutments. Both structures are to be located on the new Route 7 alignment and span over Heber Road and the South Alamo Canal.

Geology

The project site lies in the Imperial Valley as part of the Salton Trough geomorphic province. The foundation materials at the proposed bridge site consist of native material interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The native material consisted of very loose to medium dense sitly sand with lenses of lean clay with silt. Horizontal bedding and laminations are evident within the silty sand and clay layers. The materials encountered at the site during the recent field investigation consisted of native material. The general soil profile from the ground surface to the maximum depth explored consisted of:

1. Approximately 14.2 m (46.6 ft), extending to an approximate elevation of 96.9 m (317.8 ft) of very loose to medium dense silty sand with lenses of lean clay.
2. Approximately 16.7 m (54.8 ft), extending to an approximate elevation of 80.2 m (263.1 ft) of stiff lean and fat clay with silt with interbeds and lenses of silt and silty fine sand.

Refer to the LOTB sheets for more site specific data pertaining to the foundation investigations.

Groundwater

Groundwater was encountered during the field investigation on October 25, 2001 in boring B-01-1 as shown on the LOTB sheet at an approximate elevation of 108.8 m (356.8 ft). However, as a result of farm irrigation and possible canal leakage water levels can be as high as surface water level in the canal, an approximate elevation of +/- 105.0 m (344.5 ft). Perched groundwater levels measured along the project alignment near the South Alamo Canal range between 2.4 and 2.7 m below the existing ground surface. Due to the existing land in the area being primarily farm land that is irrigated and drained by a network of canals and drains, it is anticipated that groundwater levels may fluctuate. Groundwater may also vary due to seasonal precipitation.

Scour

Surface water runoff is by sheet flow that drains into the South Alamo Canal and nearby drainage ditches. All surface waters from canals and ditches drain into the Alamo River which eventually ends up in the Salton Sea. Water flow in the South Alamo Canal should have negligible scouring effect on the piles since the canal is concrete lined.

Corrosion Test Results

The corrosion test results will be provided when laboratory testing of the samples has been completed. Once the results are received, A request for corrosion recommendations that will include the corrosion test results will be submitted to the Office of Testing and Technology Services, Corrosion Technology Branch. A copy of this memorandum will be sent to the Office of Bridge Design-Central, Bridge Design Branch 14 giving the specific corrosion recommendations.

Seismic Design Considerations

The Office of Geotechnical Earthquake Engineering has provided Preliminary Seismic Design Recommendations for the site in the memorandum dated October 19, 2000. The controlling fault for the site is the Brawley-Imperial/W with a maximum credible earthquake of $M_w = 7.0$ located approximately 2.5 km southwest of the site. The estimated peak horizontal bedrock acceleration, based on the Caltrans California Seismic Hazard Map is estimated to be 0.6g.

On November 14, 2001 a request for Final Seismic Design Recommendations along with copies of the current October 2001 field investigation logs were submitted to the Office of Geotechnical Earthquake Engineering. Additional information and seismic recommendations will be included in a Final Seismic Memorandum prepared by the OGEE.

Settlement

The estimated magnitude of settlement and waiting periods will be provided when laboratory testing of the undisturbed samples has been completed.

Final Foundation Recommendations

The following foundation recommendations are for the proposed new South Alamo Canal Left and Right Bridges (Bridge No. 58-0333R/L) as shown on the General Plan dated July 2, 2001 and the Foundation Plan dated October 1, 2001. The proposed new left and right structures may be supported on Class 400C, Alternative "X" piles at Abutment 1 and 2 support locations. The recommended Specified Pile Tip Elevations (SPTE) are listed below in Table 2 for all support locations. The SPTE will provided support piles with an ultimate geotechnical pile capacity that will equal the required Nominal Resistance as shown in Table 2 below.

Table 2. Pile Data Table (Proposed New South Alamo Canal Bridges, Br. No. 58-0333L/R)

Support Location	Pile Type	Design Load	Nominal Resistance		Design Tip Elevation*	Specified Pile Tip Elevation
			Compression	Tension		
Abutment 1	Class 400C Alt. "X"	400 kN	800 kN	0 kN	95.0 m (311.7 ft) (1)	95.0 m (311.7 ft)
Abutment 2	Class 400C Alt. "X"	400 kN	800 kN	0 kN	95.0 m (311.7 ft) (1)	95.0 m (311.7 ft)

**Design tip elevations are controlled by the following demand (1) Compression.*

General Notes

1. Due to the potential for the presence of high groundwater, Type "D" structure excavation shall be shown on the plans at the Abutment 1 and 2 locations.

2. The calculated geotechnical capacities of the driven Class 400C, Alt. "X" piles at Abutment 1 and 2 locations are to be developed predominately by skin friction.

3. Due to the geotechnical capacities being based primarily on skin friction at all supports, no jetting or drilling to assist driving shall be allowed to facilitate driving piles to the specified pile tip elevation.

4. No abutment piles are to be installed through the approach embankment fills until the settlement waiting period has been completed. The settlement waiting period will be provided when consolidation testing has been completed.

5. Pile bearing for the driven Class 400C, Alt. "X" will be accessed by the ENR equation according to Standard Specifications, Section 49-1.08, "Bearing Values and Penetration".

6. At Abutment 1 and 2 locations, any driven Class 400C, Alt. "X" pile that achieves two times the required design loading as shown on the Contract Plans within in 1.5 m (5.0 ft) of the SPTE may be considered satisfactory and cut off with the written approval from the Engineer. Two times the required design loading shall be 800 kN.

7. The contractor should anticipate that the driven piles may not achieve bearing at the end of driving at the SPTE due to the nature of the underlying cohesive soils. Any driven pile that does not achieve bearing at the end of driving should be restruck after a minimum setup period. A minimum setup period of 12 hours is recommended.

The recommendations contained in this report are based on specific project information regarding structure type, location and design loads that have been provided to the Office of Bridge Design-Central, Bridge Design Branch 14. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South, Structure Foundations-South Branch should be contacted immediately to review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Jacqueline Martin at (916) 227-5282, or Mark DeSalvatore (916) 227-7056.

Report by:

Jacqueline A. Martin
Engineering Geologist
Office of Geotechnical Design-South
Structure Foundations-South Branch

Supervised by:

Date: 11/28/01

Mark DeSalvatore, R.C.E., No.039499
Senior Materials and Research Engineer
Office of Geotechnical Design-South
Structure Foundations-South Branch

REGISTERED PROFESSIONAL ENGINEER
Mark DeSalvatore
39499
EXP. 12/31/05
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File-Struct. Const.
DBarlow - Specs. & Estimates
TRuckman - Specs. & Development
RRuelas - Proj Mgmt (D11)
LHunyh - PCE
MPhelan - District (11) Project Manager
VDiaz - District (8) Project Engineer
JChai - OGES
AAbhgari - GEEB
Geology North
Geology South
RGES.30

State of California Business, Transportation and Housing Agency

Memorandum

To: JACKIE MARTIN - MS#5
Office of Geotechnical Design-South
Geotechnical Services

Date: December 14, 2001

File: 11-Imp-7-KP1.9/11.0
EA: 11-068001
Bridge No. 58-0333
L/R
South Alamo Canal
Bridges

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
MATERIALS ENGINEERING AND TESTING SERVICES - MS #5

Subject: Corrosion Review for South Alamo Canal Bridges

We have completed our corrosion review of South Alamo Canal Bridges, outlined in a December 06, 2001, memo sent to Doug Parks of the Corrosion Technology Branch. Our review is based on corrosion test results of soil samples, information from the Log of Test Borings and the California Department of Transportation (Department) Bridge Design Specifications, Article 8.22 (July 2000), and Interim Memo to Designers 10-5 (December 2000) and a Final Foundation Recommendation dated November 26, 2001.

Project Description

The new proposed South Alamo Canal Bridge consists of a left and right structure. The left and right structures consist of a single span cast-in-place reinforced box girder (8 cells for left structure and 12 cells for right structure) on seated abutments. Both structures will be located on the new Route 7 alignment and should span over Herber Road and the South Alamo Canal. It is indicated in the Final Foundation Recommendation (November 2001) that the left and right structures will be supported on Class 400C, Alternative "X" piles at Abutment 1 and 2 support locations.

The foundation materials at South Alamo Canal Bridges consist of native soil deposits derived from the historical Lake Coahuilla. This native soil is very loose to medium dense silty sand with lenses of lean clay and silt.

Corrosion Review

The Department defines a corrosive area as an area where the soil and/or water contains more than 500 ppm of chlorides, more than 2000 ppm of sulfates, has a minimum resistivity of less than 1000 ohm-cm, or has a pH of 5.5 or less.

Three borehole soil samples were obtained and tested for pH, minimum resistivity, sulfate concentration and chloride concentration in accordance with California Test Method (CTM) 643, 417 and 422. Soil sample test results are as follows:

The pH level of the soil ranged from 8.0 to 8.2. The minimum resistivity of the soil ranged from 425 ohm-cm to 750 ohm-cm. The sulfate concentration of the soil ranged from 358 ppm to 939 ppm and the chloride concentration of the soil ranged from 202 ppm to 259 ppm. Ground water was encountered in boring B-01-1 at an approximate elevation of 108.8 meters based on an October 25, 2001 field exploration, and is expected to fluctuate with seasonal changes.

Corrosion Recommendations

The soil on-site is considered corrosive based on low minimum resistivity, levels. In order to maintain a 75-year design life for the South Alamo Canal left and right structures, we recommend the following corrosion mitigation measures:

- Soil at this site is corrosive based on minimum soil resistivity values less than 1000 ohm-cm. However, chloride and sulfate concentrations were not significant (chlorides were less than 500 ppm and sulfates were less than 2000 ppm). A standard concrete mix design may be used to provide adequate corrosion protection.

If you have any questions regarding our comments, please contact Susan Hall at (916) 227-7009 or Doug Parks at (916) 227-7007.

Susan Hall

SUSAN HALL
Transportation Engineer (Civil)
Corrosion Technology Branch

Reviewed By:

Douglas Parks

DOUGLAS M. PARKS, Chief
Corrosion Technology Branch

c: Majid Madani, Division of Structure Design-Branch 14
Rob Reis, Corrosion Technology Branch
Mike Piepoli, Corrosion Technology Branch

Memorandum

Flex your power!
Be energy efficient!

To: MR. MAJID MADANI
DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN - MS 9
OFFICE OF BRIDGE DESIGN - SOUTH
BRIDGE DESIGN BRANCH 14

Attention: Mr. Tony Skreslet

Date: December 10, 2002

File: 11-IMP-7-KP 1.9/11.0
11-068001
Hunt Rd. OC (New)
Bridge No. 58-0334

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES - MS 5
GEOTECHNICAL DESIGN – SOUTH 2, BRANCH B

Subject: Amended Supplemental Foundation Recommendations

This amended report corrects a typographic error in the Foundation Recommendation section of the Supplemental Foundation Recommendations report dated October 28, 2002. This report replaces the Supplemental Foundation Recommendations report.

A request for foundation recommendations was received from Structure Design (SD), Office of Bridge Design - South, for the proposed new bridge, Hunt Rd OC, Bridge Number 58-0334. The original Foundation Report, dated November 26, 2001, did not contain settlement data for the abutment support locations. The laboratory soil analysis for the settlement data was not available at that time. This report includes the settlement data and construction recommendations.

Foundation Recommendations

The following supplemental foundation recommendations are for the proposed new bridge, Hunt Rd OC to be located on Route 7, Bridge Number 58-0334, as shown on the General Plan dated July 2, 2001. The proposed structure abutment supports will be placed in a fill embankment approximately 9.1 m (30 ft) high and 50.2 m (165 ft) wide at the base. The soils at this site consist of alternating soft to very stiff lean clays with silt, with interbeds and lenses of silty fine sand. Due to the nature of the soils located under these proposed embankments, the embankments are expected to settle approximately 500 mm (20 in) under the applied load of the new embankments. This consolidation should take place over approximately three months.

Construction Considerations

1. The fill embankment shall be placed and compacted in accordance with Standard Specifications, Section 19-6 "Embankment Construction".

2. A 1.5 m (5 ft) bridge embankment surcharge will be required. This embankment surcharge shall be placed in accordance with Standard Specifications, Section 19-6.01 "Embankment Construction", and the Standard Plan A62B "Bridge Embankment Surcharge".

3. Newly placed embankment fill will require a settlement period of 90 days prior to beginning construction of the abutment foundations in the embankment. The waiting period shall start after the embankment surcharge is in place.

4. Construction of the abutment foundations is not to begin until 100% primary consolidation of the underlying clay soils has been completed. Settlement shall be monitored. Monitoring devices shall consist of settlement platforms placed at the bottom of the fill, on existing ground prior to any fill placement.

The recommendations contained in this report are based on specific project information regarding design loads and structure support locations that have been provided to Office of Geotechnical Design – South 2, Branch B. If any conceptual changes are made during final project design, Office of Geotechnical Design - South 2, Branch B, should review those changes to determine if the foundation recommendations contained in this report are still applicable.

Any questions regarding the above recommendations should be directed to Gina Pursell, (916) 227-4539 (CALNET 498-4539), Office of Geotechnical Design – South 2, Branch B.

Report by: Date

G. W. Pursell 12/10/02

REGISTERED PROFESSIONAL ENGINEER
GINA W. PURSELL
No. 54512
Exp. 12-31-03
CIVIL
STATE OF CALIFORNIA

GINA W. PURSELL, R.C.E. # 54512
Associate Materials & Research Engineer
Office of Geotechnical Design – South 2
Branch B

cc: R.E. Pending File
John Stayton - Specs & Estimates
Tom Ruckman - Specs & Estimates
Rruelas – Project Management (D11)
Victor Diaz– Proj Engr (D11)
Lan Hunyh - PCE
Abbas Abghari – OGDS 2
Mark DeSalvatore – OGDS 2 MD
Project File - North
Project File - South

Memorandum

To: MR. MAJID MADANI
Structure Design
Office of Bridge Design - South
Bridge Design Branch 14

Date: October 28, 2002

File: 11-IMP-7- KP 1.9/11.0
11-068001

Attention: Mr. Tony Skreslet

Hunt Rd Overcrossing (New)
Br. # 58-0334

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services – MS #5
Office of Geotechnical Design – South
Structures Foundation 2 – Branch F

Subject: Supplemental Foundation Recommendations

A request for foundation recommendations was received from Structure Design (SD), Office of Bridge Design - South, for the proposed new bridge, Hunt Rd OC, bridge number 58-0334. The original Foundation Report, dated November 26, 2001, did not contain settlement data for the abutment support locations. The soil analysis for the settlement data was not available at that time. This report includes the settlement data and construction recommendations.

Foundation Recommendations

The following supplemental foundation recommendations are for the proposed new bridge, Hunt Rd OC to be located on Route 7, Bridge Number 58-0334, as shown on the General Plan dated July 2, 2001. The proposed structure abutment supports will be placed in a fill embankment approximately 9.1 m (30 ft) high. The soils at this site are alternating soft to very stiff lean clays with silt, with interbeds and lenses of silty fine sand. Due to the nature of the soils located under these proposed embankments the embankments are expected to settle approximately 152 mm (6 in). This consolidation should take place over approximately three months.

Construction Considerations

1. The fill embankment shall be placed and compacted in accordance with Standard Specifications. Section 19-6 "Embankment Construction".

2. A 1.5 m (5 ft) bridge embankment surcharge will be required. This embankment surcharge shall be placed in accordance with Standard Specifications. Section 19-6.01 "Embankment Construction". and the Standard Plan A62B "Bridge Embankment Surcharge".

3. Newly placed embankment fill will require a settlement period of 90 days prior to beginning construction of the abutment foundations in the embankment. The waiting period shall start after the five foot embankment surcharge is in place.

4. Construction of the abutment foundations is not to begin until 100% primary consolidation of the underlying clay soils has been completed. Settlement shall be monitored. Monitoring devices shall consist of settlement platforms placed at the bottom of the fill, on existing ground prior to any fill placement.

The recommendations contained in this report are based on specific project information regarding design loads and structure support locations that have been provided to Office of Geotechnical Design - South, Structure Foundation 2 – Branch F. If any conceptual changes are made during final project design, Office of Geotechnical Design, Structures Foundation 2 – Branch F, should review those changes to determine if the foundation recommendations contained in this report are still applicable.

Any questions regarding the above recommendations should be directed to Gina Pursell, (916) 227-4539 (CALNET 498-4539), Office of Geotechnical Design - South, Structure Foundation 2 – Branch F.

Report by: Date

10/29/02

REGISTERED PROFESSIONAL
Exp. 12-31-03
CIVIL

GINA W. PURSELL, R.C.E. # 54512
Associate Materials & Research Engineer
Office of Geotechnical Design - South
Structure Foundations 2 – Branch F

cc: R.E. Pending File
John Stayton - Specs & Estimates
Tom Ruckman - Specs & Estimates
Rruelas – Project Management (D11)
Victor Diaz– Proj Engr (D11)
Lan Hunyh - PCE
Mark Phelan - Proj Mgr (D11)
Abbas Abghari - OGEE
Mark DeSalvatore – GDS 2 F
Geology – North
Geology – South
John Ehsan - GDS
RGES - 30

Memorandum

To: MR. RON BROMENSCHENKEL, CHIEF
Structure Design
Office of Bridge Design-South
Bridge Design Branch 14

Attention: Tony Skreslet

Date: November 26, 2001

File: 11-IMP-7-KP 1.9/11.0
EA 11-068001

Hunt Road Overcrossing (New)
Bridge No. 58-0334

From: **DEPARTMENT OF TRANSPORTATION**
ENGINEERING SERVICE CENTER
Geotechnical Services - MS 5
Office of Geotechnical Design –South
Structure Foundations-South Branch

Subject Final Foundation Recommendations

Introduction

This report presents final foundation recommendations for the proposed new Hunt Road Overcrossing (Bridge No. 58-0334). The recommendations provided below are based on a review of the available records, laboratory data and the recent field investigation completed in October 2001 by the Office of Geotechnical Design-South, Structure Foundations-South Branch for the new proposed Hunt Road Overcrossing. The available records reviewed consisted of the General Plan dated October 4, 2001 and Foundation Plan dated October 2, 2001 and the soil data obtained during the 2001 field investigation. The 2001 field investigation consisted of six exploratory mud rotary sample borings located near the existing support locations that were advanced using a self-casing wireline drilling method. All elevations shown on the 2001 Log of Test Borings are based on the NAVD 1988 +100 m Vertical Datum. For subsurface data and boring locations, please refer to the LOTB sheets that will be forwarded once completed.

Project/Site Description

The new structure will be located on Hunt Road spanning over Route 7 at Kilometer Post 10.3 (Post Mile 6.4), in Imperial County, south of the city of Holtville. Currently at this location, Hunt Road consists of a two lane county road that runs east and west and is approximately 0.1 km south of the Orchard Road Separation/Route 8. The existing land in the area is primarily farm land that is irrigated and drained by a network of canals and drains operated by the Imperial Irrigation District.

The construction of the new bridge is a segment of the new Route 7 alignment project that consists of converting an existing two lane county road into a divided four lane highway. The proposed new structure is to consist of a two span CIP/Prestressed box girder (3 cell) on reinforced concrete single column bent on seat abutments. The new structure is to be located on Hunt Road that spans over the new Route 7 alignment.

Geology

The project site lies in the Imperial Valley as part of the Salton Trough geomorphic province. The foundation materials at the proposed bridge site consisted of native material interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The native material consisted of lean and fat clay interbedded with silt and silty sand lenses. Horizontal bedding and laminations were evident within the silt and clay layers. The materials encountered at the site during the recent field investigation can generally be divided into two units.

The native material was interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The general soil profile from the ground surface to the maximum depth explored consisted of:

1. Approximately 16.9 m (55.5 ft), extending down to an approximate elevation of 88.6 m (290.7 ft), of alternating soft and firm lean clay with silt with interbeds and lenses of silt and silty fine sand.

2. Approximately 14.0 m (45.9 ft), extending down to an approximate elevation of 74.6 m (244.8 ft), of stiff to very stiff lean and fat clay with silt with interbeds and lenses of silt and silty fine sand.

Refer to the LOTB sheets for more site specific data pertaining to the foundation investigations.

Groundwater

Groundwater was encountered during the field investigation on October 1, 2001 and is shown on the LOTB sheet at an elevation of 103.8 m (340.55 ft). Due to the existing land in the area being primarily farmland that is irrigated and drained by a network of canals and drains, it is anticipated that groundwater levels may fluctuate. Groundwater will also vary due to seasonal precipitation.

Corrosion Test Results

Corrosion test results for composite soil samples collected from Boring 01-3 are shown in Table 1, and indicate that some of the soil has a minimum resistivity less than 1,000 ohm-cm which indicates that the site is corrosive. On November 14, 2001, a request for corrosion recommendations was submitted to the Office of Testing and Technology Services, Corrosion Technology Branch. A copy of this memorandum will be sent to the Office of Bridge Design-Central, Bridge Design Branch 14 giving the specific corrosion recommendations.

Table 1. Corrosion Test Summary

Location/ Corrosion Number	Sample	pH	Minimum Resistivity (Ohm-Cm)	Sulfate Content (PPM)	Chloride Content (PPM)	Years To Perforation 18 ga. Galv. Steel Culvert
Abutment 3 Depth 0-10.8 m 01-0826	01-3	7.9	645	290	64	21
Abutment 3 Depth 10.8-18.6 m 01-0827	01-3	7.9	450	1500	200	18

Seismic Design Considerations

The Office of Geotechnical Earthquake Engineering has provided Preliminary Seismic Design Recommendations for the site in the memorandum dated October 18, 2000. The controlling fault for the site is the Brawley-Imperial/W with a maximum credible earthquake of $M_w = 7.0$ located approximately 4.6 km southwest of the site. The estimated peak horizontal bedrock acceleration, based on the Caltrans California Seismic Hazard Map is estimated to be 0.5g.

On November 14, 2001 a request for Final Seismic Design Recommendations along with copies of the current October 2001 field investigation logs were submitted to the Office of Geotechnical Earthquake Engineering. Additional information and seismic recommendations will be included in a Final Seismic Memorandum prepared by the OGEE.

Settlement

The estimated magnitude of settlement and waiting periods will be provided when laboratory testing of the undisturbed samples has been completed.

Final Foundation Recommendations

The following foundation recommendations are for the new proposed Hunt Road Overcrossing (Bridge No. 58-0334) as shown on the General Plan dated October 4, 2001 and the Foundation Plan dated October 2, 2001. The proposed new structure may be supported on Class 400C, Alternative "X" piles at Abutment 1 and 3 support locations and Class 625C, Alternative "X" piles at the Bent 2 location. The recommended Specified Pile Tip Elevations (SPTE) are listed below in Table 2 for all support locations. The SPTE will provide support piles with an ultimate geotechnical pile capacity that will equal and or exceed the required Nominal Resistances as shown in Table 2 below. Refer to Table 2 below to determine the required Nominal Resistance that controlled the SPTE.

Table 2. Pile Data Table (Proposed New Hunt Road O.C., Br. No. 58-0334)

Support Location	Pile Type	Design Load	Nominal Resistance		Design Tip Elevation*	Specified Pile Tip Elevation
			Compression	Tension		
Abutment 1	Class 400C Alt. "X"	400 kN	800 kN	0 kN	96.8 m (317.6 ft) (1)	96.8 m (317.6 ft)
Bent 2	Class 625C Alt. "X"	625 kN	1250 kN	350 kN	86.3 m (283.1 ft) (1) 99.7 m (327.1 ft) (2)	86.3 m (283.1 ft)
Abutment 3	Class 400C Alt. "X"	400 kN	800 kN	0 kN	96.8 m (317.6 ft) (1)	96.8 m (317.6 ft)

**Design tip elevations are controlled by the following demand (1) Compression and (2) Tension.*

General Notes

Support locations are to be plotted on the Log of Test Borings in the plan view as stated in "Memos to Designers" 4-2. The plotting of support locations should be made prior to requesting a final foundation review.

Construction Considerations

1. Due to the presence of high groundwater, Type "D" structure excavation shall be shown on the plans at the Bent 2 location.

2. The calculated geotechnical capacities of the driven Class 400C Alt. "X" piles at Abutment 1 and 3 locations and the Class 625C Alt. "X" piles at Bent 2 location are to be developed predominately by skin friction.

3. Due to the geotechnical capacities being based primarily on skin friction at all supports, no jetting or drilling to assist driving shall be allowed to facilitate driving piles to the specified pile tip elevation.

4. The Class 400C Alt. "X" piles at both the Abutment 1 and 3 locations are to be driven in predrilled holes through the approach embankment fills. The predrilling shall be in accordance with Section 49-1.06 of the Standard Specifications, "Predrilled Holes," and shall not extend below elevation 105.7 m (346.8 ft).

5. No abutment piles are to be installed through the approach embankment fills until 100% primary consolidation of the underlying clay soils has been completed.

6. Pile bearing for the driven Class 400C. Alt. "X" and the driven Class 625C, Alt. "X" will be accessed by the ENR equation according to Standard Specifications, Section 49-1.08, "Bearing Values and Penetration".

7. At Abutment 1 and 3 locations, any driven Class 400C, Alt. "X" pile that achieves two times the required design loading as shown on the Contract Plans within in 1.5 m (5.0 ft) of the SPTE may be considered satisfactory and cut off with the written approval from the Engineer. Two times the required design loading shall be 800 kN.

8. At Bent 2 location, any driven Class 625C, Alt. "X" pile that achieves two times the required design loading as shown on the Contract Plans within 1.5 m (5.0 ft) of the SPTE may be considered satisfactory and cut off with the written approval from the Engineer. Two times the required design loading shall be 1250 kN.

9. The contractor should anticipate that the driven piles may not achieve bearing at the end of driving at the SPTE due to the nature of underlying cohesive soils. Any driven pile that does not achieve bearing at the end of driving should be restruck after a minimum setup period. A minimum setup period of 12 hours is recommended.

The recommendations contained in this report are based on specific project information regarding design loads and structure location that has been provided to the Office of Bridge Design-Central, Bridge Design Branch 14. If any conceptual changes are made during final project design, the Office of Geotechnical Design-South, Structure Foundations-South should be contacted immediately to review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Jacqueline Martin at (916) 227-5282, or Mark DeSalvatore (916) 227-7056.

Report by:

Jacqueline A. Martin

Jacqueline A. Martin
Engineering Geologist
Office of Geotechnical Design-South
Structure Foundations-South Branch

Supervised by: Date: 11/28/01

Mark DeSalvatore, R.C.E., No.039499
Senior Materials and Research Engineer
Office of Geotechnical Design-South
Structure Foundations-South Branch

REGISTERED PROFESSIONAL ENGINEER
MARK DeSALVATORE
No. CE039499
Exp. 12/31/05
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File-Struct. Const.
TRuckman - Specs. & Development
LHunyh - PCE
VDiaz - District (8) Project Engineer
AAbhgari - GEEB
Geology South
DBarlow - Specs. & Estimates
RRuelas - Proj Mgmt (D11)
MPhelan - District (11) Project Manager
JChai - OGES
Geology North
RGES.30

State of California

Business, Transportation and Housing Agency

Memorandum

To: Jackie Martin-MS#5
Office of Geotechnical Design-South
Geotechnical Services

Date: November 21, 2001

File: 11-Imp-7-KP 1.1/ 11.0)
EA: 11-068001
Bridge No. 58-0334
Hunt Road Overcrossing

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
MATERIALS ENGINEERING AND TESTING SERVICES - MS #5

Subject: Corrosion Review for Hunt Road Overcrossing

We have completed our corrosion review of Hunt Road Overcrossing, outlined in a November 14, 2001, memo sent to Doug Parks of the Corrosion Technology Branch. Our review is based on corrosion test results of soil samples, information from the Log of Test Borings and the California Department of Transportation (Department) Bridge Design Specifications, Article 8.22 (July 2000), and Interim Memo to Designers 10-5 (December 2000) and a Preliminary Foundation Recommendation dated November 16, 2000.

Project Description

The proposed Hunt Bridge Overcrossing is a cast-in-place/prestressed box girder bridge, which consists of two-spans. The purpose of the Hunt Road Overcrossing is to carry traffic from Hunt Road over the future Route 7. This site is located approximately 17 m (56 feet) south of the existing Hunt Road and 0.64-km (0.4 miles) south of Route 8 and Orchard Road.

The Hunt Bridge Overcrossing appears to be underlain by Playa deposits consisting of silt and clay admixtures with interbeds of water bearing sand.

It is our understanding that the foundation recommendations for the proposed Hunt Bridge Overcrossing consist of driven precast prestressed concrete and open-ended steel pipe or H-section piles.

Corrosion Review

Caltrans defines a corrosive area as an area where the soil and/or water contains more than 500 ppm of chlorides, more than 2000 ppm of sulfates, has a minimum resistivity of less than 1000 ohm-cm, or has a pH of 5.5 or less.

Two borehole soil samples were obtained and tested for pH, minimum resistivity, sulfate concentration and chloride concentration in accordance with California Test Method (CTM) 643, 417 and 422. Soil sample test results are as follows:

The pH level of the soil was 7.9. The minimum resistivity of the soil ranged from 450 ohm-cm to 645 ohm-cm. The sulfate concentration of the soil ranged from 290 ppm to 1,500 ppm and the chloride concentration of the soil ranged from 64 ppm to 200 ppm. Ground water is expected at an approximate elevation of 0.6 meters to 0.9 meters below ground surface and is expected to fluctuate with seasonal changes.

Corrosion Recommendations

In order to maintain a 75-year design life for the structure, we recommend the following corrosion mitigation measures:

- Soil at this site is corrosive based on minimum soil resistivity values less than 1000 ohm-cm. However, chloride and sulfate concentrations were not significant (chlorides were less than 500 ppm and sulfates were less than 2000 ppm). A standard concrete mix design (in accordance with BDS Article 8.22) may be used to provide adequate corrosion protection.

- The steel pipe piles require a corrosion allowance of 1.9 mm. This represents a corrosion allowance of 1 mil per year (0.025 mm per year) for steel piles driven into undisturbed soil embedded zones for a 75-year design life.

  The corrosion rate listed above should be doubled for steel H-piling in order to provide protection on both sides of the web and flanges that are exposed to corrosive soil; the corrosion allowance is 3.8 mm (0.025 mm/yr. x 75 yr. x 2 exposure faces).

A corrosion allowance is required for steel piles driven into undisturbed soil. The region with greatest susceptibility to corrosion is the portion of the pile from the bottom of the pile cap or footing down to 1 meter below the mean low water elevation (embedded pile corrosion zone). This zone is higher in dissolved oxygen, which results in corrosion in the presence of corrosive soils. For steel pipe piles, the corrosion allowance is only required on the exterior surface of the pile. The interior surface of the pile will not be exposed to sufficient oxygen to support significant corrosion.

If you have any questions regarding our comments, please contact Susan Hall at (916) 227-7009 or Doug Parks at (916) 227-7007.

Susan Hall

SUSAN HALL
Transportation Engineer (Civil)
Corrosion Technology Branch

Reviewed By:

DOUGLAS M. PARKS, Chief
Corrosion Technology Branch

c: Majid Madani, Division of Structure Design-Branch 14
Rob Reis, Corrosion Technology Branch
Mike Piepoli, Corrosion Technology Branch

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
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To: MR MAJID MADANI
DIVISION OF ENGINEERING SERVICES
OFFICE OF BRIDGE DESIGN SOUTH
Bridge Design Branch 14
MS 9-4/11G

Attention: Mr. Tony Skreslet

Date: September 18, 2002

File: 11-IMP-7-KP 1.9/11

11-068001
Orchard Road Sep (widen)
Tieback Retaining Wall
Bridge No. 58-0218

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design - South
Branch F

Subject: **Amended Foundation Recommendations**

In a memo dated August 21, 2002, the Office of Bridge Design South has provided OGDS, Branch F, with new tieback locations for the proposed Tieback Retaining Wall No. 2, located at Abutment 3 of Bridge 58-0218. A review of the newly submitted General Plan, Foundation Plan and Retaining Wall Details (all plans dated 08-20-02) was conducted to determine if there should be a modification to the unbonded length of the tieback anchors.

The slight change in the location of the tieback anchors will not impact the unbonded length. The tables below reflect the new stationing of the tieback anchor locations, and should be included as an addendum to the memo, " Foundation Recommendations", dated June 13, 2002.

Table 4.
Tieback Retaining Wall No. 2, Top Row Anchor Data

Tieback Anchor Number (top row)	Approximate Anchor Location (station)	Approximate Anchor Elevation at Wall Face		Unbonded Anchor Length	
		Meters	Feet	Meters	Feet
1	778+89.1	107.9	354.0	6.1	20.0
2	778+94.0	107.9	354.0	6.1	20.0
3	778+98.6	107.9	354.0	6.1	20.0
4	779+03.2	107.9	354.0	6.1	20.0
5	779+07.5	107.9	354.0	6.1	20.0
6	779+12.4	107.9	354.0	6.1	20.0
7	779+14.9	107.9	354.0	6.1	20.0

Table 5.
Tieback Retaining Wall No. 2, Second Row Anchor Data

Tieback Anchor Number (second row)	Approximate Anchor Location (station)	Approximate Anchor Elevation at Wall Face		Unbonded Anchor Length	
		Meters	Feet	Meters	Feet
1	778+84.2	106.7	350.1	6.1	20.0
2	778+89.1	106.7	350.1	6.1	20.0
3	778+94.0	106.7	350.1	6.1	20.0
4	778+98.6	106.7	350.1	6.1	20.0
5	779+03.2	106.7	350.1	6.1	20.0
6	779+07.5	106.7	350.1	6.1	20.0
7	779+12.4	106.7	350.1	6.1	20.0
8	779+17.3	106.7	350.1	6.1	20.0

Table 6
Tieback Retaining Wall No. 2, Bottom Row Anchor Data

Tieback Anchor Number (second row)	Approximate Anchor Location (station)	Approximate Anchor Elevation at Wall Face		Unbonded Anchor Length	
		Meters	Feet	Meters	Feet
1	778+84.2	105.5	346.1	6.1	20.0
2	778+89.1	105.5	346.1	6.1	20.0
3	778+94.0	105.5	346.1	6.1	20.0
4	778+98.6	105.5	346.1	6.1	20.0
5	779+03.2	105.5	346.1	6.1	20.0
6	779+07.5	105.5	346.1	6.1	20.0
7	779+12.4	105.5	346.1	6.1	20.0
8	779+17.3	105.5	346.1	6.1	20.0

Any questions regarding the above recommendations should be directed to Kathleen Amaru (916) 227-5387 or Mark DeSalvatore (916) 227-5391.

Report by:

Kathleen Amaru, CEG No. 2184
AssociateEngineering Geologist
Office of Geotechnical Design-South
Structure Foundations Branch F

cc
RE Pending File-Struct Construct
Tom Ruckman-Specs and Development
RRuelas-Project Management (D11)
Victor Diaz- (D11) Project Engineer
John Stayton-Specs and Estimates
Lan Hunyh-Project Coordination Engineer
Mark Phelan- D (11) Project Manager
Abbas Abhgari-OGEE
Geology South
Mark DeSalvatore-OGDS
RGES.30

State of California **Business, Transportation and Housing Agency**

Memorandum

Flex your power!
Be energy efficient!

To: MR. RON BROMENSCHENKEL, Chief
Structure Design
Office of Bridge Design - South
Bridge Design Branch 14

Attention: Tony Skreslet

Date: July 25, 2002

File: 11-IMP-7-KP 1.9/11.0
EA 11-068001
Orchard Road Sep. (Widen)
Type 1 Retaining Walls/
Tieback Retaining Wall
Bridge No. 58-0218

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design - South MS #5

Subject: Addendum to Foundation Recommendations

The following is an Addendum to the Foundation Recommendations for the proposed Type 1 Retaining Walls and Tieback Retaining Wall for the Orchard Road Separation (Br. #58-0218). The purpose of this Addendum is to correct the support locations listed in Table 2. Spread Footing Data Type 1 Retaining Walls-Abutment 1 (South) and the support locations listed in Table 3. Spread Footing Data Type 1 Retaining Walls-Abutment 3 (North) that was incorrectly incorporated in the original report. The original locations were scaled from an 8 ½ X11 Retaining Wall Details sheet (dated December 4, 2001) faxed on December 6, 2001 and were illegible. The following two tables listed below supercede the previous two tables sent in the original report.

Table 2. Spread Footing Data : Type 1 Retaining Walls Abutment 1 (South)

Support Location	Design Height of Wall	Minimum Excavation Elevation	Bottom of Footing Elevation	Recommended Soil Bearing Pressures: ASD [1] Gross Allowable Soil Bearing Pressure (q_{all})	Recommended Soil Bearing Pressures: LFD [2] Ultimate Soil Bearing Pressure (q_{ult}^*)
Abutment 1 From Approx. Sta. 778+73.0 to Approx. Sta. 778+81.0	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A
Abutment 1 From Approx. Sta. 778+81.0 to Approx. Sta. 779+09.5	2.4 m (8.0 ft)	103.9 m (340.8 ft)	104.5 m (342.8 ft)	100 kPa (1.0 tsf)	N/A
Abutment 1 From Approx. Sta. 779+09.5 to Approx. Sta. 779+21.0	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A

Notes: 1) Allowable Stress Design, (ASD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Soil Bearing Pressure, (q_{all}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Gross Allowable Soil Bearing Pressure, (q_{all}).
2) Load Factor Design, (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^*). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^*).

Table 3. Spread Footing Data: Type 1 Retaining Walls-Abutment 3 (North)					
Support Location	Design Height of Wall	Minimum Excavation Elevation	Bottom of Footing Elevation	Recommended Soil Bearing Pressures	
				ASD [1]	LFD [2]
				Gross Allowable Soil Bearing Pressure (q_{all})	Ultimate Soil Bearing Pressure (q_{ult}^{*})
Abutment 3 From Approx. Sta. 778+69.4 to Approx. Sta. 778+77.4	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A
Abutment 3 From Approx. Sta. 778+77.4 to Approx. Sta. 779+82.1	2.4 m (8.0 ft)	103.9 m (340.8 ft)	104.5 m (342.8 ft)	100 kPa (1.0 tsf)	N/A
Abutment 3 From Approx. Sta. 779+19.8 to Approx. Sta. 779+22.6	2.4 m (8.0 ft)	103.9 m (340.8 ft)	104.5 m (342.8 ft)	100 kPa (1.0 tsf)	N/A
Abutment 3 From Approx. Sta. 779+22.6 to Approx. Sta. 779+24.8	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A

Notes: 1) Allowable Stress Design, (ASD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Soil Bearing Pressure, (q_{all}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Gross Allowable Soil Bearing Pressure, (q_{all}).
2) Load Factor Design, (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^{*}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^{*}).

Any questions regarding the above recommendations should be directed to Jacqueline Martin at (916) 227-5392, or Mark DeSalvatore (916) 227-5391, of the Office of Geotechnical Design-South, Structure Foundations-Branch F.

Report by:

Supervised by: Date: 7/29/02

Jacqueline A. Martin

REGISTERED PROFESSIONAL ENGINEER
MARK DeSALVATORE
No. C039499
Exp. 12/31/05
CIVIL
STATE OF CALIFORNIA

Jacqueline A. Martin
Engineering Geologist
Office of Geotechnical Design-South
Structure Foundations-Branch F

Mark DeSalvatore, R.C.E., No.039499
Senior Materials and Research Engineer
Office of Geotechnical Design-South
Structure Foundations-Branch F

cc: R.E. Pending File-Struct. Const.
John Stayton - Specs. & Estimates
Tom Ruckman - Specs. & Development
Lan Hunyh -- Project Coordination Engineer
RRuelas - Project Management (D11)
Mark Phelan - District (11) Project Manager
Victor Diaz - District (11) Project Engineer
John Ehsan - OGES
Abbas Abhgari - GEEB
Geology North
Geology South
RGES.30

Memorandum

Flex your power!
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To: MR. RON BROMENSCHENKEL, Chief
Structure Design
Office of Bridge Design - South
Bridge Design Branch 14

Date: June 13, 2002

File: 11-IMP-7-KP 1.9/11.0
EA 11-068001
Orchard Road Sep. (Widen)
Type 1 Retaining Walls/
Tieback Retaining Wall
Bridge No. 58-0218

Attention: Tony Skreslet

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design - South MS #5

Subject: Foundation Recommendations

Introduction

This report presents foundation recommendations for the proposed Type 1 Retaining Walls and Tieback Retaining Wall for the Orchard Road Separation (Br. #58-0218). During the completion of the Foundation Recommendation Report for the bridge, the Office of Geotechnical Design-South, Structure Foundations Branch F received revised design layouts from Structure Design (dated December 4, 2001). The revised design layouts were for the proposed Type 1 Retaining Walls at Abutment 1 (South) and the revised design layouts for the proposed Type 1 Retaining Walls and a Tieback Retaining Wall at Abutment 2 (North). The elevations shown on the As-Built Log of Test Borings (LOTB) are based on the NGVD 1929+500 ft. The elevations shown on the 2001 Log of Test Borings are based on the NAVD 1988 +100 m. All elevations referred to in this report are based upon the NAVD 1988+100 m. For subsurface data and boring locations, please refer to the LOTB sheets that will be forwarded once completed. Based on a review of the design layouts and the soil data obtained during the 2001 field investigation, we submit the following foundation recommendations for the proposed Type 1 Retaining Walls and the Tieback Retaining Wall.

Project/Site Description

Currently at the site is an existing bridge that spans over Route 8 and is located at Kilometer Post 11.0 (Post Mile 6.8) on Route 7 in Imperial County, south of the city of Holtville. The existing Orchard Road Separation, built in 1971 by the Division of Highways, consists of a two lane county road that is a segment of the new Route 7 alignment. The existing structure spans over Route 8 with west and east bound on and off ramps to and from Route 8. The proposed Retaining Walls and the Tie Back Wall are required for the proposed widening of Route 8.

Geology

The 2001 field investigation consisted of three exploratory mud rotary sample borings located near the existing support locations that were advanced using a self-casing wireline drilling method.

The project site lies in the Imperial Valley as part of the Salton Trough geomorphic province. The foundation materials at the proposed bridge site consisted of fill material underlain by native material interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The fill material consisted of silty sand with gravel. The native underlying material consisted of lean and fat clay interbedded with silt and sitly sand lenses. Horizontal bedding and laminations were evident within the silt and clay layers. The materials encountered at the site during the recent field investigation can generally be divided into two units.

The soils in the upper most units were interpreted as fill material placed during the construction of the Orchard Separation in 1971. The fill material was approximately 8.4 m (27.6 ft) thick and extended to an approximate elevation of 103.8 m (340.5 ft). The fill material consisted of approximately 6.6 m (21.5 ft) of medium dense and dense silty sand with gravel overlying approximately 1.8 m (5.9 ft) of medium dense silty sand with lean clay.

Underlying the fill material located at each abutment location was the lower most unit that was interpreted as recent lake bed (lacustrine) deposits derived from the historical Lake Coahuilla. The general soil profile from the ground surface to the maximum depth explored consisted of:

1. Approximately 15.7 m (51.5 ft), extending down to an approximate elevation of 89.8 m (294.6 ft) of soft and firm to stiff lean clay with silt with interbeds and lenses of silt and silty fine sand.

2. Approximately 4.6 m (15.1 ft), extending down to an approximate elevation of 85.2 m (279.5 ft) of loose to medium dense silty fine sand.

3. Approximately 10.6 m (34.8 ft), extending down to an approximate elevation of 74.6 m (244.8 ft) of stiff to very stiff lean and fat clay with silt with interbeds and lenses of silt and silty fine sand.

Refer to the LOTB sheets for more site specific data pertaining to the foundation investigations.

Groundwater

Groundwater was encountered during the field investigation on October 18, 2001 as shown on the LOTB sheet at an approximate elevation of 103.2 m (338.6 ft). The As-Built LOTB sheet shows the groundwater at an approximate elevation of 102.9 m (337.6 ft). Due to the existing land in the area being primarily farmland that is irrigated by a network of canals, it is anticipated that groundwater levels may fluctuate. Groundwater will also vary due to seasonal precipitation.

Corrosion Test Results

Soil samples collected near Abutment 1 location (B-01-1) and Abutment 3 location (B-01-3) were combined to make composite samples during the foundation investigation. The Office of Testing and Technology Services, Corrosive Technology Branch tested the composite samples for corrosive potential. The results of the laboratory tests determined that the composite samples were considered to be corrosive. Refer to Table 1 below for specific test results.

Table 1: Corrosion Test Summary-Composite Samples
For Orchard Road Separation (Br. No. 58-0218)

Support Location/ Corrosion Number	Sample Depth (m)	pH	Minimum Resistivity (Ohm-Cm)	Sulfate Content (PPM)*	Chloride Content (PPM)*
B-01-1 Abutment 1 #01-0968	0-9.1	7.9	465	1409	167
B-01-1 Abutment 1 #01-0969	9.1-21.3	7.8	220	969	1800
B-01-3 Abutment 3 #01-0970	0-8.4	8.0	655	1073	86
B-01-3 Abutment 3 #01-0971	8.4-20.3	8.0	570	592	220

*The Corrosion Technology Branch defines a site to be corrosive if the soil and/or water contains more than 500 ppm of chlorides, or more than 2000 ppm of sulfates, or has a minimum resistivity of less than 1000ohm-cm or has a pH of 5.5 or less.

Please refer to the specific corrosion recommendations completed on December 14, 2001 and submitted to the Office of Bridge Design-South, Bridge Design Branch 14 by the Office of Testing and Technology Services, Corrosion Technology Branch.

Seismic Design Considerations

The Office of Geotechnical Earthquake Engineering (OGEE) provided Final Seismic Design Recommendations for the site in the memorandum dated December 20, 2001. The controlling fault for the site is the Brawley-Imperial/W with a maximum credible earthquake of $M_w = 7.0$ located approximately 4.8 km southwest of the site. The estimated peak horizontal bedrock acceleration, based on Caltrans California Seismic Hazard Map is estimated to be 0.5g. Liquefaction analysis indicates the soil does not have the potential to liquefy though shallow groundwater is present at the site. Refer to the groundwater section of the report for elevations measured during the February 1965 and the recent October 2001 foundation investigations.

Please refer to Jinxing Zha or Angel Perez-Cobo at the Office of Geotechnical Earthquake Engineering if there are any questions with the Final Seismic Design Recommendations.

Foundation Recommendations

Abutment 1 (South)-Type 1 Retaining Walls

The proposed Type 1 Retaining Wall structures at the bridge Abutment 1 (South) location may be supported with spread footings. The recommended gross allowable soil bearing pressures that may be used for design are provided below in Table 2.

Table 2. Spread Footing Data
Type 1 Retaining Walls-Abutment 1 (South)

Support Location	Design Height of Wall	Minimum Excavation Elevation	Bottom of Footing Elevation	Recommended Soil Bearing Pressures: ASD[1] Gross Allowable Soil Bearing Pressure (q_{all})	Recommended Soil Bearing Pressures: LFD[2] Ultimate Soil Bearing Pressure (q_{ult}^*)
Abutment 1 From Approx. Sta. 778+53.0 to Approx. Sta. 778+58.0	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A
Abutment 1 From Approx. Sta. 778+58.0 to Approx. Sta. 779+16.0	2.4 m (8.0 ft)	103.9 m (340.8 ft)	104.5 m (342.8 ft)	100 kPa (1.0 tsf)	N/A
Abutment 1 From Approx. Sta. 779+16.0 to Approx. Sta. 779+21.0	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A

Notes: 1) Allowable Stress Design, (ASD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Soil Bearing Pressure, (q_{all}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Gross Allowable Soil Bearing Pressure, (q_{all}).
2) Load Factor Design, (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^*). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^*).

The recommended gross allowable soil bearing pressures are based on the following factors: (1) the maximum applied toe pressures are for loading case III as shown in the "Standard Plans (July 1999)" on sheet B3-1 (2) the spread footings have a minimum footing width as shown in the "Standard Plans (1999)" for appropriate Type 1 Retaining Wall heights (H) as shown on the Retaining Wall Details No. 1 Sheet (dated December 4, 2001) (3) the footings shall be supported on a layer of structure back fill compacted to 95% relative compaction and the bottom of the footing is to be at or below the bottom of footing elevations listed in Table 2 above. Should the bottom of footing elevations be lowered, the bottom of footing elevations and minimum excavation elevations need to be adjusted accordingly. Sub-excavation of native material and replacement with structure backfill beneath the retaining wall footings shall be the zone within the following limits established by: (1) an inclined plane sloping 1:1.5 (vertical:horizontal) out and down from a line 0.3 m in front of the bottom of the toe of the footing and (2) a vertical plane 0.3 m behind the bottom of the heel of the footing. If any of the footing widths or minimum sub-excavation requirements as shown above in Table 2 are reduced, the Office of Geotechnical Design-South, Structure Foundation-Branch F is to be contacted for reevaluation.

Abutment 3 (North)-Type 1 Retaining Wall

The proposed Type 1 Retaining Wall structures at the bridge Abutment 3 (North) location may be supported with spread footings. The recommended gross allowable soil bearing pressures that may be used for design are provided below in Table 3.

Table 3. Spread Footing Data
Type 1 Retaining Walls-Abutment 3 (North)

Support Location	Design Height of Wall	Minimum Excavation Elevation	Bottom of Footing Elevation	Recommended Soil Bearing Pressures: ASD [1] Gross Allowable Soil Bearing Pressure (q_{all})	Recommended Soil Bearing Pressures: LFD [2] Ultimate Soil Bearing Pressure (q_{ult}^*)
Abutment 1 From Approx. Sta. 778+69.5 to Approx. Sta. 778+75.0	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A
Abutment 1 From Approx. Sta. 778+75.0 to Approx. Sta. 779+80.5	2.4 m (8.0 ft)	103.9 m (340.8 ft)	104.5 m (342.8 ft)	100 kPa (1.0 tsf)	N/A
Abutment 1 From Approx. Sta. 779+20.5 to Approx. Sta. 779+23.0	2.4 m (8.0 ft)	103.9 m (340.8 ft)	104.5 m (342.8 ft)	100 kPa (1.0 tsf)	N/A
Abutment 1 From Approx. Sta. 779+23.0 to Approx. Sta. 779+25.5	1.8 m (6.0 ft)	104.0 m (341.3 ft)	104.5 m (342.8 ft)	80 kPa (0.8 tsf)	N/A

Notes: 1) Allowable Stress Design, (ASD). The Maximum Contact Pressure, (q_{max}), is not to exceed the recommended Gross Allowable Soil Bearing Pressure, (q_{all}). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Gross Allowable Soil Bearing Pressure, (q_{all}).
2) Load Factor Design. (LFD). The Maximum Contact Pressure, (q_{max}), divided by the Strength Reduction Factor, (ϕ), is not to exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^*). The Ultimate Soil Bearing Capacity, (q_{ult}), will equal or exceed the recommended Ultimate Soil Bearing Pressure, (q_{ult}^*).

The recommended gross allowable soil bearing pressures are based on the following factors: (1) the maximum applied toe pressures are for loading case III as shown in the "Standard Plans (July 1999)" on sheet B3-1 (2) the spread footings have a minimum footing width as shown in the "Standard Plans (1999)" for appropriate Type 1 Retaining Wall heights (H) as shown on the Retaining Wall Details No. 1 Sheet (dated December 4, 2001) (3) the footings shall be supported on a layer of structure back fill compacted to 95% relative compaction and the bottom of the footing is to be at or below the bottom of footing elevations listed in Table 3 above. Should the bottom of footing elevations be lowered, the bottom of footing elevations and minimum excavation elevations need to be adjusted accordingly. Sub-excavation of native material and replacement with structure backfill beneath the retaining wall footings shall be the zone within the following limits established by: (1) an inclined plane sloping 1:1.5 (vertical:horizontal) out and down from a line 0.3 m in front of the bottom of the toe of the footing and (2) a vertical plane 0.3 m behind the bottom of the heel of the footing. If any of the footing widths or minimum sub-excavation requirements as shown above in Table 3 are reduced, the Office of Geotechnical Design-South, Structure Foundation-Branch F is to be contacted for reevaluation.

Abutment 3 (North)-Tieback Retaining Walls

The following recommendations are for the proposed Tieback Retaining Wall at the Abutment 3 (North) location (shown on the Retaining Wall Details No. 2 Sheet dated December 6, 2001). The recommended soil parameters to be used to obtain soil pressures on the backside of the retaining wall are provided below.

Average dry unit weight of soil (backfill), $\gamma = 18.9\ kN/m^3$
Average angle of internal friction (backfill), $\phi = 34°$
Active earth pressure coefficient, Ka = 0.28

Provided below in Tables 4, 5, 6 and 7 are the recommended unbonded lengths for the tieback anchors. The minimum required unbonded lengths were determined using an anchor inclination of 15 degrees below horizontal. The minimum unbonded anchor length is to be 6.1 m (20.0 ft). The approximate anchor stations were scaled off the most recent Retaining Wall Details No. 2 Sheet (dated December 6, 2001). Refer to Tables 4 through 7 for Tieback Retaining Wall Data.

Table 4. Tieback Retaining Wall No. 2, Top Row Anchor Data

Tieback Anchor Number (Top Row)	Approx. Anchor Location (STA.)	Approx. Anchor Elev. at the Wall Face		Unbonded Anchor Length	
		m	ft	m	ft
1	778+94.0	107.6	353.0	6.1	20.0
2	778+98.6	107.6	353.0	6.1	20.0
3	779+03.2	107.6	353.0	6.1	20.0
4	779+07.5	107.6	353.0	6.1	20.0
5	779+12.4	107.6	353.0	6.1	20.0

Table 5. Tieback Retaining Wall No. 2, Second Row Anchor Data

Tieback Anchor Number (Second Row)	Approx. Anchor Location (STA.)	Approx. Anchor Elev. at the Wall Face		Unbonded Anchor Length	
		m	ft	m	ft
1	778+89.4	107.4	352.4	6.1	20.0
2	779+17.3	107.4	352.4	6.1	20.0

Table 6. Tieback Retaining Wall No. 2, Third Row Anchor Data

Tieback Anchor Number (Third Row)	Approx. Anchor Location (STA.)	Approx. Anchor Elev. at the Wall Face		Unbonded Anchor Length	
		m	ft	m	ft
1	778+84.8	106.9	350.7	6.1	20.0

Table 7. Tieback Retaining Wall No. 2, Bottom Row Anchor Data

Tieback Anchor Number (Bottom Row)	Approx. Anchor Location (STA.)	Approx. Anchor Elev. at the Wall Face		Unbonded Anchor Length	
		m	ft	m	ft
1	778+84.8	105.9	347.4	6.1	20.0
2	778+89.4	105.9	347.4	6.1	20.0
3	778+94.0	105.9	347.4	6.1	20.0
4	778+98.6	105.9	347.4	6.1	20.0
5	779+03.2	105.9	347.4	6.1	20.0
6	779+07.5	105.9	347.4	6.1	20.0
7	779+12.4	105.9	347.4	6.1	20.0
8	779+17.3	105.9	347.4	6.1	20.0

General Notes

1. Should there be any reduction in the spread footing dimensions, a change in location or wall height, or an increase in the bottom of footing elevations for the Type 1 Retaining Walls, the Structure Foundations, Branch F must be notified to reevaluate the recommended gross allowable soil bearing pressures to be used for design and the limits of sub-excavation and replacement with structure backfill.

2. Support locations for the spread footings are to be plotted on the Log of Test Borings in plan view as stated in "Memos to Designers" 4-2.

Construction Considerations

1. Groundwater infiltration into footing excavations for the Type 1 Retaining Walls should be anticipated by the contractor. Type D excavations are to be shown on the plans.

2. All concrete for Retaining Wall footings shall be placed neat on the undisturbed compacted structure backfill. If the structure backfill at the bottom of the footing elevation is disturbed, the material shall be compacted to a relative compaction of 95% in accordance with Standard Specifications (1999) 19-5.03.

Any questions regarding the above recommendations should be directed to Jacqueline Martin at (916) 227-5392, or Mark DeSalvatore (916) 227-5391, of the Office of Geotechnical Design-South, Structure Foundations-Branch F.

Report by:

Jacqueline A. Martin

Jacqueline A. Martin
Engineering Geologist
Office of Geotechnical Design-South
Structure Foundations-Branch F

Supervised by: Date: 6/13/02

Mark DeSalvatore, R.C.E., No.039499
Senior Materials and Research Engineer
Office of Geotechnical Design-South
Structure Foundations-Branch F

REGISTERED PROFESSIONAL ENGINEER
MARK DESALVATORE
No. CE039499
Exp. 12/31/05
CIVIL
STATE OF CALIFORNIA

cc: R.E. Pending File-Struct. Const.
John Stayton - Specs. & Estimates
Tom Ruckman - Specs. & Development
Lan Hunyh – Project Coordination Engineer
RRuelas - Project Management (D11)
Mark Phelan - District (11) Project Manager
Victor Diaz - District (11) Project Engineer
John Ehsan - OGES
Abbas Abhgari - GEEB
Geology North
Geology South
RGES.30

Memorandum

Flex your power!
Be energy efficient!

To: JACKIE MARTIN
Engineering Geologist
Structure Foundations South Branch

Date: June 14, 2002

File: 11-IMP-7-KP
19/11.0
EA: 11-068001
<u>Orchard Road Separation Type 1/ Tieback Retaining Walls</u>
Bridge No: 58-0218

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
MATERIALS ENGINEERING AND TESTING SERVICES – MS #5

Subject: Corrosion Review for Orchard Road Separation

We have completed our corrosion review of the Orchard Road Separation requested in your June 11, 2002, memo sent to Doug Parks of the Corrosion Technology Branch. Our review is based on corrosion test results of soil samples, information from the Log of Test Borings, a draft copy of the final foundation recommendations for the Type 1 and Tieback Retaining walls, dated June 11, 2002, a draft copy of the final foundation recommendations for the seismic retrofit of Bent 2, dated June 11, 2002, the Bridge Design Specifications, Article 8.22 (July 2000), and the Interim Memo to Designers 10-5 (December 2000).

Project Description

The Orchard Road Separation is a segment of the new Route 7 alignment project that consists of converting the existing two-lane road into a divided four-lane highway. The existing structure was built in 1971 by the Division of Highways and consists of a two span continuous reinforced concrete box girder on reinforced concrete open-end diaphragm abutments and a single column bent, all supported on driven concrete piles. This structure will be widened and retrofitted at Bent 2 in order to accommodate the new alignment

Corrosion Review

The California Department of Transportation defines a corrosive area as an area where the soil and/or water has a minimum resistivity of less than 1000 ohm-cm, and either contains more than 500 ppm of chlorides, more than 2000 ppm of sulfates, or has a pH of 5.5 or less.

Four borehole samples were collected at the site and tested for pH, minimum resistivity, sulfate concentration, and chloride concentration in accordance with California Test Methods (CTM) 643, 417 and 422. Soil sample test results are as follows:

The pH level of the soil ranged from 7.8 to 8.0. The minimum resistivity of the soil ranged from 220 to 655 ohm-cm. The sulfate concentration of the soil ranged from 592 ppm to 1409 ppm, and the chloride concentration of the soil ranged from 86 ppm to 1800 ppm.

Ground water depth is at an approximate elevation of 103 m and is anticipated to fluctuate due to seasonal precipitation and farmland irrigation.

Corrosion Recommendations

The in-situ soil is considered corrosive based on high chloride concentrations. In order to maintain a 75-year design life for the structure, we recommend the following mitigation measures:

- Any reinforced concrete in contact with the corrosive soil, such as the CIDH piles at the Bent 2 support location and the spread-footings for the Type 1 Retaining Walls at Abutments 1 and 3 etc., should be designed in accordance with BDS Article 8.22 (July 2000). Reference Specification S8-C 04 (90CORR) "Corrosion Control for Portland Cement Concrete" should be used to ensure compliance with the requirements of BDS Article 8.22 (July 200). Tom Ruckman (916-227-8591) of the Structures Specifications Branch should be contacted for assistance related to Reference Specification S8-C 04 (90CORR). The controlling corrosion parameter for reinforced concrete at this site is a soil chloride concentration of 1800 ppm.

- We concur with both design alternatives for the Tieback Tendons as shown on the Tieback Details sheet NO. 2 of the plans, as they both contain the double corrosion protection system (polyethylene coating and grout) specified in SSP 50-560 (50TIEB).

If you have any questions regarding our comments, please contact Mike Piepoli at (916) 227-7068 or Doug Parks at (916) 227-7007.

Michael Piepoli

MICHAEL PIEPOLI
Transportation Engineer (Civil)
Corrosion Technology Branch

Reviewed By:

Douglas M. Parks

DOUGLAS M. PARKS
Chief
Corrosion Technology Branch

c: Arron Rambach, Corrosion Technology Branch
Susan Hall, Corrosion Technology Branch